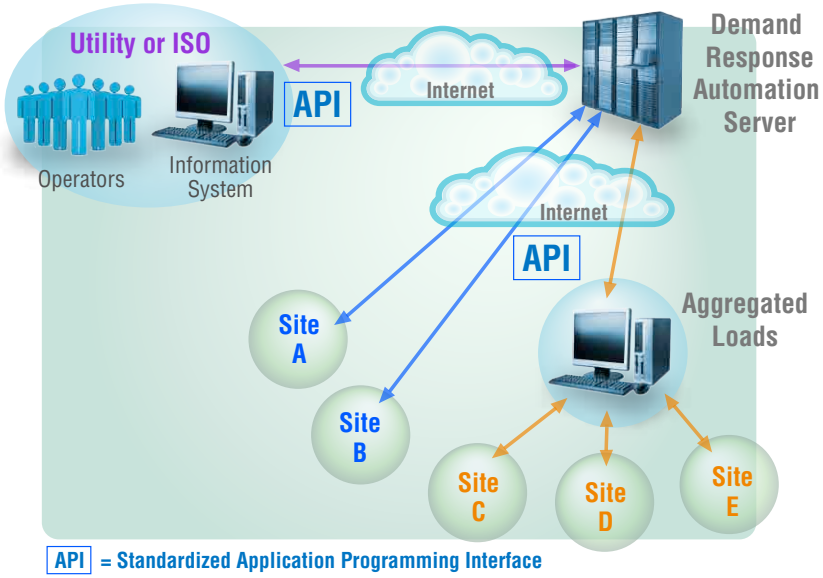
Open Automated Demand Response Open Source Technology Development

In collaboration with commercial energy-sector software developer Utility Integration Solutions (UISOL), Demand Response Research Center developed an open source OpenADR Toolkit that contains Java-based software implementations of an OpenADR server and client. This is a freely distributable, "research grade" OpenADR server program suitable for widespread experimentation and design studies.

Conceptually, the OpenADR specification can be implemented as a straightforward web application that conveys energy price and grid reliability information from energy suppliers to industrial, commercial, and residential energy consumers. In practice, however, the lack of software to support and manipulate OpenADR constructs such as demand response programs and event lists, and to support robust, reliable customer communications has hindered development.

While OpenADR has been widely and successfully demonstrated in the commercial and industrial domain, these activities have all depended on a single proprietary OpenADR software implementation. As interest in OpenADR increased, it became clear that dependence on a single OpenADR server design was at odds with OpenADR's goal of an open, freely available automated demand response server design. The lack of a truly open-source OpenADR implementation constituted a "barrier to entry" for researchers and vendors wanting to explore new, unique OpenADR applications. As a result, the Demand Response Research Center (DRRC) sought to develop a freely distributable, "research grade" OpenADR server program suitable for widespread experimentation and design studies. In collaboration with commercial energy-sector software developer Utility Integration Solutions (UISOL), the DRRC developed an open source OpenADR Toolkit that contains Java-based software implementations of an OpenADR server and client.



Based on the OpenADR v1.0 specification published by the DRRC, the server portion of this toolkit can function as a stand-alone Demand Response Automation Server (DRAS) capable of formatting and distributing OpenADR events to participating clients. This code base has been used to create demonstration deployments and has been packaged as a web-distributable collection of program sources.

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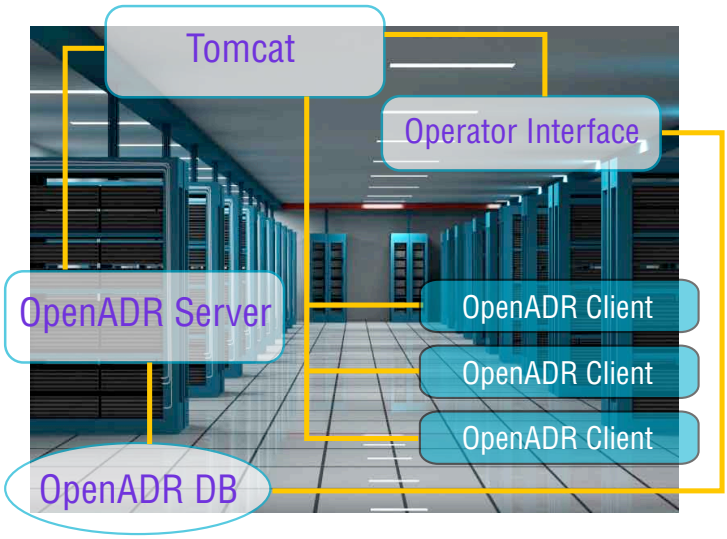
The OpenADR Open Source Toolkit: Key Highlights and Features

- The toolkit is a suitable demonstration platform for exploring OpenADR functionality, configuration, and operation with minimal coding effort.
- It is easily configured to create small-scale pilot and research-oriented OpenADR systems—both DRAS and client components. This capability is particularly useful for exploring utility-side operator interactions and evaluating client-side designs.
- The modular toolkit components provide "clean room" building blocks to facilitate OpenADR program validation and certification testing activities, such as those now being formalized within the OpenADR Alliance.
- Both server and client toolkit components are modular enough to be incorporated into smart grid simulation frameworks to explore grid responses to OpenADR events under various grid reliability and energy price scenarios.



- Both server and client code is Java-based and is readily integrated into other popular open-source programs, notably the Apache Tomcat web application server.
- Although it is implemented using the freely available Oracle Express database, the toolkit server can be ported readily to other databases, such as MySQL and Postgres.
- Modular design makes the toolkit components suitable for use as part of either "independent" or "integrated" DRAS designs (i.e., command-driven or utility system-integrated designs).

Benefits

- The OpenADR toolkit is a widely available, clean, and unencumbered code base that can be used to rapidly implement many elements of the forthcoming OASIS Energy Interconnect (EI) standard. The demand-response portions of this standard constitute the industry-accepted OpenADR v2.0 standard.
- It promotes rapid development of OpenADR standard certification tools and firmly establishes a stable and viable OpenADR marketplace.
- It promotes development of large, metropolitan-scale smart grid models that integrate customer behavioral response to demand response inputs.

Funding

Funding for the development of the Open Source Toolkit is provided by the California Energy Commission.

Related Links:

Demand Response Research Center and Publications: http://drrc.lbl.gov/drrc-pubs.html
OpenADR Website: http://openadr.lbl.gov
OpenADR Alliance: http://www.openadr.org/

Key OpenADR Articles and Materials:

CEC OpenADR-Version 1.0 Report. Piette, M.A., G. Ghatikar, S. Kiliccote, E. Koch, D. Hennage, P. Palensky, and C. McParland. 2009. *Open Automated Demand Response Communications Specification (Version 1.0).* California Energy Commission, PIER Program. CEC-500-2009-063 and LBNL-1779E.

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